[redacted]

25X1A2g

when the deeper operations are undertaken. Double-deck cages are provided to handle 40 men per trip.

6. "The main shaft now in operation consists of two hoisting compartments and a chippy compartment. The remaining compartment is a manway and for service, pipe, etc. The present hoist must be moved and used in the chippy compartment for general service and timber. This requires that the new headframe be built over and around the existing headframe.

7. "The new headframe is 105 feet from collar to sheave shaft and is designed for a combined breaking stress of 128 tons for the two $1\frac{1}{4}$" hoisting ropes. It is equipped with retractable guides of SWECO design for rapid change from skip to cage and vice versa. When making the change the guides are retracted and the skip is lowered on lazy chains hung in ears on the skip until supported on a geared chain hoist mounted on a trolley on a monorail. The hoisting cable is then clamped and disengaged from the skip which is rolled out of the way and the cage rolled into position, hoisting rope fastened, unclamped, and the cage raised, guides replaced, and the lazy chains removed.

8. "The skips dump into either the ore bin or waste bin of 250 short ton capacity each. The waste bin empties through an air actuated arc gate to cars for disposal at the waste dump while the ore bin discharge is controlled by a flash-board type cut-off gate and a No 6 Ross Chain Feeder controlling the flow through a $47\frac{1}{2}$" x 63" opening. The Ross Feeder is run at 5.6 RPM by Morse Chain and Sprockets from a 3 HP Falk Motor Reducer and feeds the material over a 4" grizzly made from 100-pound rail, flange up.

9. "The maximum size of materials from underground grizzlies is expected to be 12", using ring blasting underground. The oversize material is crushed to 4" in a 36" x 42" type HB Traylor Jaw Crusher at the rate of 185 short tons per hour. The crusher is driven at 175 RPM by a 125 HP General Electric wound rotor, 1,000 RPM motor and 'V' Belts. It is equipped with Farval automatic lubrication and has a two-piece main frame to accommodate the port handling equipment. The crusher grizzly undersize, estimated at 35 short tons per hour, by-passes the crusher and beds a 30" conveyor ahead of the crusher discharge which passes over a rock box onto an Australian bottom discharge chute to eliminate wear of the belt at the loading point.

10. "All of the conveying equipment is by /a US company/. Their 'Pacific Type' carriers and return idlers are used throughout. The conveyors are all driven by Morse chain and sprockets from Falk motoreducers.

11. "The 30" conveyor is inclined at an 18° angle and the stream of ore passes under a suspended magnet, powered by a $1\frac{1}{2}$ KW MG set.

12. "The belt is furnished by /a US company/ and is 5 ply 32 oz, with a 3/16" top cover and a 1/16" bottom cover.

13. "The belt speed is 150 FPM with a rated capacity of 370 tons per hour to handle the circulating load from the secondary stage of crushing.

14. "The above conveyor discharges onto a 5' x 12" Hewitt-Robins Eliptex single deck screen. Three sizes of screen cloth have been provided ($1\frac{1}{2}$", 2" and $2\frac{1}{2}$") to enable the heavy-media separation (HMS) unit to operate at the optimum particle size. This will be determined subsequently when operation of the plant is started.

15. "The plus $1\frac{1}{2}$" material, estimated at 150 TPH, goes by gravity to the second crushing stage which is a $4\frac{1}{4}$' Standard Symons Cone Crusher set at $1\frac{1}{2}$" in closed circuit with the above scalping screen by means of another inclined 24" conveyor running at 150 FPM.

16. "The second crushing stage mentioned above and the third stage following the HMS unit are both standard $4\frac{1}{4}$' Symons cone crushers. These crushers use the newly developed coarse stepped liners of manganese steel and are equipped with auxiliary oil pumps, air seals, automatic tramp iron release and are each driven by 10 D V-Belts and a 125 HP - 50 cycle General Electric Squirrel Cage Motor.

17. "Every attempt has been made in the design of this plant to standardize the equipment used so that there is a minimum variety of repair parts required for the operation. The cone crushers are duplicates and the screens used throughout the plant are all of the same width and design so that one spare vibrator unit can be used for replacement on all screens. This plant, as has been mentioned, is 800 miles from the East African sea coast and is approximately one year from replacement parts from the US. Consequently, the maintenance of the operating equipment will be of the greatest importance to insure continued efficient operation.

18. "The scalping screen undersize -$1\frac{1}{2}$" from the secondary crushing stage is delivered to a coarse ore storage pile of 3000-ton capacity by a 24" belt conveyor at 300 FPM, 220 TPH capacity and another 24" belt conveyor equipped with a Stephens-Adamson manually operated tripper for distribution of the ore on the storage pile.

19. "The 3000 ton storage pile is excavated in the ground and a rigid frame structure carrying the tripper conveyor and the aluminum roof is supported on concrete retaining walls. Under the pile a tunnel is provided, in the roof of which there are 17-2' x 2' openings equipped with Stephens-Adamson rack and pinion gates. The ore flow is controlled by a 22" Stephens-Adamson Manganese Pan Feeder traveling on rails from opening to opening as required. The quantity of ore discharged is controlled by a 3 HP Reeves Vari Speed Motordrive.

20. "The pan feeder discharges onto a 20" belt conveyor @ 175 FPM, which carries 120 TPH horizontally to another 20" inclined conveyor which delivers the ore to the washing screen ahead of the HMS unit. This conveyor is equipped with a Type 'S' Merrick Weightometer which weighs all the ore to be treated.

21. "To prevent shutting these conveyors down under load, in case of mechanical troubles in the HMS plant, and also to supply ore to the flotation unit when it is not desired to run the HMS plant, a by-pass gate controlled by electrical interlock with the HMS circuits by-passes the ore automatically so that, unless the HMS plant is in operation, the ore is by-passed around it.

22. "To provide metallurgical control of the HMS plant a sample preparation plant has been included in the plant design. Samples are taken mechanically of the weighed feed and the weighed tailings or float products.

23. "The initial samples of the 1½" feed and float products are taken continuously by two 36" heavy duty Geary Jennings samplers with 7½" x 14" Type C cutters mounted on track.

24. "These samplers will cut out 1% of the ore, or 12 tons per day in the case of the feed with the HMS plant operating 10 hours per day and 7 tons of the float product estimated at a maximum of some 70 TPD. These samples are conveyed by 12" belt conveyors to a storage bin divided into 12½ tons for the feed and 7½ tons for the float. Each of these bins is divided in half and the sampling plant is designed to treat all of the two samples in one 10-hour shift.

25. "Each pocket of the storage bin is equipped with a Stephens-Adamson undercut gate which delivers on to one Syntron Vibrating Feeder. Since only one gate is to be operated at a time only one feeder is required for the four sections.

26. "To crush the sample a Denver 9" x 14" Jaw Crusher now in use in the pilot mill on the property will be set to one-half inch. This product will again be cut at 1% by a 20" chain drive Geary Jennings Sampler which will feed its sample to a MASCO 6" Gy-Roll Reduction Crusher to crush the sample to 10 mesh. Following this crushing stage, another 20" Geary Jennings will cut out 1/50 to 1/100 of ore for the final sample for analysis. All rejects from the sample plant join the sink product of the HMS unit and are sent to the flotation unit for further treatment.

27. "A complete laboratory is now on the property and will be moved to a newly constructed building provided with Pressure Hoods and Ventilators which will allow the sample preparation, chemical analysis, fire assay and an experimental laboratory under one roof.

28. "The wash screen preparing the feed to the HMS Plant is a 5' x 12' Hewitt-Robins Eliptex Triple Deck with 1/2" supper gyraloy square opening on the top deck, 1/4" of the same on the middle deck and 14 mesh on the bottom deck. Washing of the material is provided by water sprays, and the -14 mesh material is fed to a 30" SPDS Akins Classifier. The +14 mesh -1/4" material joins the rake product of the classifier and the sink product from the HMS plant and is conveyed to the third crushing and screening stage. The +1/4" material comprises the HMS plant feed.

29. "The overflow product from the 30" classifier is laundered to a 30' Dorr Thickener which recovers the water while the thickener underflow is pumped to a splitter box which divides the flow evenly to the two rod mills.

30. "To prevent upsetting the rod mill operation by periodically feeding these fines, the overflow of the splitter box is pumped to a 16' diameter storage agitator where it will be kept in suspension by a 48" impeller driven by a

25 HP motor. In this way the flow of fines from 10 hours of HMS plant operation can be spread out over the 24 hours of rod mill operation.

31. "For economical mining wide sections of the shear zone must be excavated, with considerable resultant waste dilution.

32. "Ring drilling with rib and panel stoping and/or continuous retreat along strike will be employed.

33. "Good waste rock elimination by differential density separation at as coarse sizes as possible is of primary importance.

34. "The HMS plant provided for the operation is the standard 100 TPH packaged unit as sold by [a US company], using the Akins Separatory vessel and ferro-silicon medium. The 48" Akins Separator as developed by [a US company] has the distinct advantage of being able to discard the middling particles and thus provides a convenient operating control. In the Uruwira plant the sink, middling and float are drained on a 5' x 8' single deck Robins Eliptex screen partitioned for each of the three products. About 90% of the medium will be recovered by this screen and returned by a 4" Wilfley Pump to a steady head tank over the separator. The wash screen following the drainage screen is a 5' x 12' Robins Eliptex again partitioned for the three products. The material washed off on this screen is cleaned on a 38" Jeffrey Company 2-Drum Type Magnetic Separator. The medium recovered by this machine is demagnetized, densified and returned to the medium circuit while the non-magnetic material is passed on to the flotation circuit for the recovery of any contained values.

35. "Following the wash screen, the float product is conveyed to the tailings pile after being sampled. The middling and sink product are joined and sent to the third crushing and screening stage. After testing of the middling product when the plant is operating it may be found that further treatment of the middling would be advantageous in which case separate handling of the material can be added very easily.

36. "The following show the results of tests made on the ore by South African Cyanamid (PTY) Ltd at a 2.79 separation specific gravity.

Product	% Weight In Size	% Weight In Total	% Pb	% Cu	% Distribution In Size % Pb	% Distribution In Size % Cu	% Distribution In Total % Pb	% Distribution In Total % Cu
Calc Head		100.0	2.59	0.55			100.0	100.0
-10 Mesh		9.5	5.40	0.82			19.8	14.3
Cone Feed	100.0	90.5	2.29	0.52	100.0	100.0	80.2	85.7
Sink 2.85	36.5	33.0	6.01	1.32	95.6	93.2	76.6	79.9
2.85-2.80	16.2	14.7	0.59	0.12	4.2	3.9	3.4	3.3
Float 2.80	47.3	42.8	0.01	0.03	0.2	2.9	0.2	2.5
Sink 2.85 + 3/16"	34.8	31.5	5.83	1.28	88.6	86.0	71.0	73.7
Sink 2.85 - 3/16"	1.7	1.5	9.65	2.26	7.0	7.2	5.6	6.2
2.85 x 2.80 + 3/16"	15.3	13.9	0.53	0.11	3.6	3.3	2.9	2.8
2.85 x 2.80 - 3/16"	0.9	0.8	1.59	0.36	0.6	0.6	0.5	0.5
Float 2.80 + 3/16"	42.1	38.1	0.01	0.03	0.2	2.4	0.2	2.1
Float 2.80 - 3/16"	5.2	4.7	0.01	0.05	0.0	0.5	0.0	0.4

37. "The 1½" Sink Product, themiddling and the dewatered -1/4" material join on a 20" belt conveyor equipped with a 20" ∅ Dings Magnetic Head Pulley for removal of tramp iron. The conveyor discharges onto a 5' x 8' Hewitt-Robins Eliptex Single Deck Screen with 3/4" SuperGyraloy screen cloth which feeds the +3/4" material to the third crushing stage. The discharge of this crushing stage joins the -3/4" material from the above screen on a 20" conveyor which conveys the ore to the fine ore bins.

38. "This crusher is a 4¼ Std Symons Cone and is a duplicate of the second stage crusher. This stage is not in closed circuit with the screen as the oversize passing the crusher will not greatly affect the rod mill operation and would require a greater equipment outlay.

39. "The 500 ton fine ore bins are provided at the head of the main mill building to store the ore from the last crushing stage before grinding. The feed is divided between the two bins by a reversing conveyor on top.

40. "The physical location of the plant has controlled the structural and mechanical design to a great extent. The best location for the mill was on a gentle slope, unfortunately considerably above the shaft collar which required that the primary crushing section be located near the shaft since conveying large rock any distance would require heavy belt conveyors. Consequently, the crusher foundation has required extensive excavation at the shaft to keep the height of the headframe down. Also, with cheap labor, excavations are not as expensive as in this country and every advantage has been taken of this fact. Even taking this into account there is a difference of 100 feet between the shaft collar and the top of the fine ore bins at the mill and 800 feet horizontally. The result of these conditions is that the conveyor system to bring the crushed ore to the mill bins is some 1300 feet long and inclined at a maximum angle of 18° wherever possible.

41. "In the pilot plant operation, which incidentally has kept the operation in the black, it was felt that tailings losses were caused by overgrinding with the consequent sliming of the lead. In the new mill the grinding will be done by two duplicate units of 6 x 10 Marcy Rod Mills in closed circuit with two 54" Simplex Akins Classifiers.

42. "The two mill bins are provided with three openings on the center line of the bottom. Each opening is controlled by a 20" x 20" Stephens-Adamson Rack and Pinion Gate with a 12" x 20" Stephens-Adamson open-type rotary vane feeder delivering to 18" belt conveyors, each of which is equipped with a type 'S' Merrick Weightometer.

43. "Two of the feeders on each bin are driven by Reeves Vari-Drive Motor Reducers while the third with its own Reeves Drive is controlled on or off by constant weight switches actuated by the weightometers providing a simple yet effective automatic tonnage control of the Rod Mill Feed. Since all drives are variable speed the amount of hunt by the third feeder can be adjusted to the best advantage.

44. "The grinding circuit consists of two 6' x 10' IS Liner Diameter Marcy Overflow Type Rod Mills equipped with the smooth manganese steel liner with reversible lifter bars as developed at one of our plants. They are fed from the fine ore bins at the rate of 305 TPD, to which is added 25 TPD of the thickened fines from the HMS Washing Screen to coat the rod charge and gain maximum capacity. Each mill is fed by a double scoop handling the circulating load and a drum type feeder taking the new feed. Each mill is in closed circuit with a 54" Simplex type 'S' Akins Spiral Classifier which will overflow 330 TPD at 25% solids all minus 35 mesh.

45. "The classifier overflows are sampled by a Geary-Jennings Automatic Pulp Sampler before being pumped to the flotation cells. All pumps used on the mill pulps are Wilfley Type K sand pumps with overhead motor drives and standard White iron parts. Two sizes, 4" and 2" are used to handle all flows and fabricated steel sumps, as recommended by Wilfley, are placed ahead of each pump.

46. "The flotation section is composed of two banks of roughers with two stages of cleaning. The rougher cells are 48" Agitair cells composed of 10 cells in groups of four and six with the froth from the first rougher fed to the first cleaning stage. The tail from the first rougher is pumped to the second rougher which makes a final tailing.. The froth from this second rougher is returned with the first cleaner tail to the flotation feed pump. The first cleaner froth is cleaned further by the second cleaner in closed circuit with the first cleaner and makes the final concentrate. The cleaner cells are 18" SP (32" x 32") Denver Sub A's with two cells in each stage. Tailings from the second rougher and the final concentrates are each sampled by standard Geary-Jennings pulp samples for metallurgical control.

47. "The reagents used in the operation have been determined from the pilot plant operation. Reagent 404 and xanthate are fed to each Rod Mill scoop box while sodium sulphide and cresylic acid are fed to the classifier overflow at the sump of the flotation feed pump.. Lime, in dry form, is fed from a Syntron Vibrating Feeder to each conveyor belt feeding the Rod Mills. All reagent mixing and feeders are located in a room above and ahead of the grinding section and Duplex Clarkson Reagent Feeders are used for all solutions feeding into funnels where they are washed to the feed points by gravity flow in pipe. In this way all reagent control is centralized at one point for accurate and easy control. Supplementary single portable Clarkson Feeders are provided to add frother wherever it may be required in the float circuit.

48. "The grinding section and the flotation section are both on the same level in the building which is 80 feet wide and 100 feet long, broken into two 50 feet bays. Each bay is provided with Wright Traveling Cranes with Yale and Towne chain blocks for full coverage of both operating floors. The pumps are located in a tunnel under the flotation section with covered openings so that the cranes can be used for maintenance work in the tunnel. Gravity flows in the plant are carried, in most cases, in open unlined wood launders with pressure flows from the pumps in standard black iron pipe.

49. "The concentrates produced, estimated at 66 TPD containing 50% Pb and 10% Cu, 1000 GPT Ag, 20 GPT, Au, are filtered, after sampling, using an Eimco Six-leaf 6 feet diameter filter arranged for two products (future operation). Weighing this filter cake has presented a problem as the material is very sticky and will come off the filter blade in lumps. Since the concentrates will weigh approximately 250 pounds per cubic feet, weighing these lumps on a continuous weighing scale would be very inaccurate. Any type of batch weighing would require a hopper of some kind which would be very difficult to clean between batches. In an effort to overcome this trouble a sample of lead concentrates was obtained at approximately 12% moisture and a Syntron Vibrating Feeder pan was loaded with this material pressed into large lumps. The feeder was very effective in shaking out the lump into almost a ribbon flow of the pulp. This idea was utilized in the Uruwira Mill by providing a F33 Syntron Feeder with a 12" x 55" pan taking the concentrates from a conveyor under the filter, shaking out the lumps and delivering the material to a belt conveyor equipped with a standard type S Merrick Weightometer.

50. "At present the camp is serviced by one train per week of 300 ton capacity, which will be stepped up to two 400 ton trains. However, due to port conditions and inadequate shipping facilities, storage must be provided for three months concentrate production or some 7,500 tons. Also the shipment of concentrate must be bagged just prior to shipment as the concentrate rots the bags quickly. To provide the necessary facilities the concentrates are conveyed to a storage building with a distributing conveyor to load a storage pile uniformly. Space is provided all around the pile

[redacted]

for bag loading and 'Exact Weight' bag weighing machines with 'Union Special' bag sowers are mounted together on a platform on wheels, forming two separate units, to facilitate the bag loading operation.

51. "The tailing or float product from the HMS Plant is weighed and sampled before being transported by conveyor to the tailings disposal pile. The flotation tailings are also carried by this conveyor after dewatering as much as possible. As the property is developed it is expected that the flotation tailings will be used for mine fill. For this purpose the tailings will be prepared by means of a Dorrclone which will be used at the start to dewater the tails prior to their discard. The Dorrclone overflow will be thickened utilizing a 50 feet Dorr Thickener now on the property with the thickened underflow placed on the tailings conveyor which, fortunately, is down grade.

52. "All water is recovered where possible in the operation and pumped back to a mill water tank. The HMS Plant is supplied direct from the main water supply storage and the water used recirculated. The clear water is handled by Ingersoll-Rand size 3 CRVN single stage centrifugal pumps, and it is expected that the water loss will not be over 60 GPM.

53. "All water for the operation is to be pumped some 43 miles from the Ugalla River. The water depth of this river varies some 22 feet from lowest recorded level to the highest recorded flash flood. The first pumping station is excavated at the riverbank 10 feet deep, so as to allow two feet of freeboard above the highest flash flood level. The suction line of the two pumps is carried 168 feet from the pump to the foot valves by floats so that the foot valve is just below the water level at all times. The flexing is to be provided by two 12 foot lengths of rubber suction hose.

54. "The pumps are two Gardner Denver FD-FXD 5" x 10" Duplex Double Action Power Pumps, 200 GPM capacity, driven with Caterpillar diesel engines of 68 and 75 KW capacity. The pumps discharge into two 6" pipe lines which are $1\frac{1}{4}$ miles long until they join into an 8" line, $15\frac{1}{2}$ miles long, which then divides again into two 6" lines, 3-3/4 miles from a second pumping station. The second pumping station is a duplicate of the first except that it is above ground. Each of these pumps discharges into 6" pipe lines $12\frac{1}{4}$ miles long, discharging into a 500 thousand gallon submerged concrete storage tank on the brow of the highest elevation. This tank had to be buried to prevent elephants tearing it down during droughts.

55. "From this reservoir the water flows by gravity through a 10" line, 10-1/3 miles long, until divided into two 6" lines for 4-1/3 miles more, to a 500 thousand gallon tank similar to that mentioned above on a hill above the plant.

56. "This pipe line has been designed utilizing war surplus pipe available in Africa and the location of the various lines has been dependent on the bursting pressures of the pipe available. All the pipe must be buried